IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellants:	Steven Say-Kyoun Ow and Tae Jin Eom		
Serial No.:	09/121,152	Art Unit:	1731
Filed:	July 22, 1998	Examiner:	Jason L. Lazorcik
For:	*BIOLOGICAL DE-INKING METHOD*		

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This is an appeal from the final rejection of claims 21-28, 30-38, 40, and 42-50 in the Office Action mailed May 9, 2006, in the above-identified patent application. A Notice of Appeal was filed on August 9, 2006. The Commissioner is hereby authorized to charge $250.00, the fee for the filing of this Appeal Brief for a small entity, to Deposit Account No. 50-3129. It is believed that no additional fee is required with this submission. However, should an additional fee be required, the Commissioner is hereby authorized to charge the fee to Deposit Account No. 50-3129.

(1) REAL PARTY IN INTEREST

The real party in interest of this application is the assignee, the Korea Research Institute of Chemical Technology, and the licensee Enzymatic Deinking Technologies, LLC, Norcross, Georgia.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to appellant, the undersigned, or appellant's assignee which directly affects, which would be directly affected by, or which would have a bearing on the Board's decision in this appeal.

(3) STATUS OF CLAIMS

Claims 21-28, 30-38, 40, and 42-50 are pending. Claims 1-20, 29, 39, and 41 have been cancelled. Claims 21-28, 30-38, 40, and 42-50 are on appeal. The text of each claim on appeal, as pending, is set forth in an Appendix to this Appeal Brief.

(4) STATUS OF AMENDMENTS

The claims were last amended in an Amendment filed via facsimile transmission on February 16, 2006. An amendment after final rejection was electronically filed on August 9, 2006. In the Advisory Action mailed on August 23, 2006, the Examiner indicated that this amendment would not be entered. An appendix sets forth the claims on appeal.

(5) SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 21 is directed to a method of de-inking waste printed paper, comprising (a) pulping at a pH between 3 and 8 waste printed paper with an enzyme capable of dislodging ink particles from the waste printed paper in an aqueous medium at a pH between 3

and 8, wherein ink is dislodged from the waste printed paper by action of the enzyme; and (b) removing the dislodged ink particles from the resulting pulp containing medium. The dislodged ink particles can be removed by flotation or washing (dependent claims 22 and 23; page 6, lines 10-16). The concentration of the enzyme is from about 0.005% to about 5.0% by weight based on the dry weight of the wastepaper (dependent claim 24; page 6, lines 4-5). The enzyme is selected from the group consisting of cellulases, pectinases, and mixtures thereof (dependent claim 25; page 6, lines 19-20). The cellulases are *Trichoderma viride*, *Aspergillus niger*, hemicellulases, other carbohydrases or mixtures thereof (dependent claim 26; page 6, lines 21-22). The enzyme can also be an acid-resistant cellulase (dependent claim 48; page 6, lines 22-23). The method can be done without the addition of alkali to the aqueous medium (dependent claim 27; page 5, lines 8-9). The pulp can have a consistency of about 12% or greater (dependent claim 28; page 6, lines 1-2). The pulping can also be done in a conventional pulper at a consistency of between 4% and 7% (dependent claims 49-50; page 6, lines 2-3). The pulping is performed at a temperature between room temperature to about 60°C (dependent claim 30; page 6, line 4).

Independent claim 31 is directed to a method of recycling waste printed paper, comprising: (a) pulping waste printed paper; (b) contacting at a pH between 3 and 8 waste printed paper at high wastepaper pulping consistency with an enzyme capable of dislodging ink particles from the waste printed paper in an aqueous medium at a pH between 3 and 8, wherein ink is dislodged from the waste printed paper by action of the enzyme; and (c) removing dislodged ink particles from the resulting pulp containing medium (page 6, lines 5-7). The

enzyme can be a cellulase derived from *Trichoderma viride*, *Aspergillus niger* or mixtures thereof wherein the cellulase is used in an amount between 0.005 and 5.0 percent-by-weight based on the dry weight of the waste printed paper, the contacting being carried out at a temperature between room temperature and about 60°C (dependent claims 32-35; page 6, lines 3-5 and lines 19-23). The dislodged ink particles can be removed by flotation or washing (dependent claim 36; page 6, lines 10-16). The method can be done without the addition of alkali to the aqueous medium (dependent claim 37; page 5, lines 8-9). The pulping can occur at a consistency of 12% and 15% (dependent claim 38; page 6, lines 1-2). The pulping is performed at a temperature from room temperature to about 60°C (dependent claim 40; page 6, line 4). The enzymes enhance the removal of heavily coated inks, highly polymerized inks, non-impact inks, or cured polymer resins and are effective in debonding fiber bonding (dependent claims 42-44; page 7, lines 3-11 and the examples). The enzyme may degrade the fibers by enzymatic hydrolysis (dependent claims 45-47; page 7, lines 6-8).

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issues presented on appeal are:

(1) whether claims 27, 28, and 37 satisfy the written description requirement as required by 35 U.S.C. § 112, first paragraph;

(2) whether claims 21-27, 30, 41, 45, and 47-50 are non-obvious as required by 35 U.S.C. § 103(a) over Japanese Application 59-9299 ("JP '299"), in view of U.S. Patent No. 4,923,565 to Fuentes *et al.* ("Fuentes"); and

(3) whether claims 28, 31-38, 40, 42-44, and 46 are non-obvious as required by 35 U.S.C. § 103(a) over JP '299, in view of Fuentes, further in view of U.S. Patent No. 4,548,674 to Hageman *et al.* ("Hageman").

(7) ARGUMENTS

The claimed method is directed to enhancing the deinking efficacy in the paperrecycling process. A biological method is employed that enhances the ink and contaminant detachment from fibers and the subsequent removal of these undesired materials from the pulp stock. This improved deinking efficacy creates pulp stocks that are cleaner, brighter and with less contaminants that alternate methods. Such improved efficacy enables mills to improve final quality and/or reduce costs of wastepaper used or other chemistries employed in attaining the necessary final pulp characteristics.

(a) Rejections under 35 U.S.C. § 112, first paragraph

Claims 27, 28, and 37 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor had possession of the claimed invention.

The examiner sets forth two reasons in support of this rejection. Final Rejection, mailed May 9, 2006 (FR), pages 6-7. First, the examiner states that the limitation "alkali is not added to the aqueous medium" of claims 27 and 37 is not disclosed in the specification. *Id.* In explanation the examiner states that "[a]lthough the specification indicates that no alkali is required, nothing in the specification specifically excludes the addition of alkaline reagents, particularly as a group.' *Id.* Second, the examiner states in regard to claim 28, "the limitation

'12% or greater' exceeds the range disclosed in the specification. The highest consistency disclosed is 15%." *Id.*

Legal Standard

Compliance with the written description requirement of 35 U.S.C. § 112, first paragraph, is a question of fact and must be assessed on a case-by-case basis. *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1561, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991). It is settled law that the original disclosure of a patent application need not describe the claimed subject matter in issue *in haec verba*. *Fujikawa v. Wattanasin*, 93 F.3d 1559, 1570, 29 USPQ2d 1895, 1904 (Fed. Cir. 1996). However, the original disclosure of the patent application must convey with reasonable clarity to those skilled in the art that the inventor was in possession of the invention now claimed. *Vas-Cath Inc.*, 935 F.2d at 1563-64, 19 USPQ2d at 1116-17. In other words, one skilled in the art must reasonably discern the claim limitation at issue from reading the original disclosure of the patent application. *Waldemar Link GMBH & Co. v. Osteonics Corp.*, 32 F.3d 556, 558, 31 USPQ2d 1855, 1857 (Fed. Cir. 1994). It is the examiner's initial burden to present evidence or reasons why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims. *In re Wertheim*, 541 F.2d 257, 263, 191 USPQ 90, 97 (CCPA 1976).

Analysis

i. ***Claim 27 Satisfies the Written Description Requirement***

The examiner states that the portion of claim 27 reciting that alkali is not added to the aqueous medium is not disclosed in the specification in that, while the specification indicates that

alkali is not required, "nothing in the specification specifically excludes the addition of alkaline reagents, particularly as a group." FR, pages 6-7.

The examiner is correct that the specification states that alkali is not required in the present invention. Specification, page 5, lines 8-11. Claim 27 is quite clear that alkali is not added to the aqueous medium. It is not apparent why the examiner injects the concept of "alkaline reagents, particularly as a group" into the written description analysis since the plain language of claim 27 is that alkali, not alkaline reagents, is not added to the aqueous medium. It may be that the examiner is equating the word "alkali" as used in claim 27 with the term "alkaline reagents, particularly as a group." If so, as a matter of logic, "alkali" and "alkaline reagents, particularly as a group," are synonymous in the examiner's mind since appellants are only required to provide written description for the claimed subject matter, not terms that are coined by the examiner. Thus, if "alkaline reagents, particularly as a group" is not synonymous with "alkali" as used in claim 27, the examiner's comment is self defeating as claim 27 does not state that alkaline reagents, particularly as a group, are not added to the aqueous medium. Thus, that phrase need not be described in the original disclosure of this patent application. On the other hand if the two terms are synonymous, the disclosure in the specification that alkali is not added means that appellants were also in possession of the concept now injected by the examiner, *i.e.*, "alkaline reagents, particularly as a group" are not added, as well, since one term equates to the other. Either way the term is read, the rejection is improper.

It should be noted that the examples according to the present invention set forth in the specification did not add alkali to the aqueous medium. This is further evidence that the

examiner's rejection is incorrect. The examiner stated that "[a]lthough alkali is not expressly added to the enzyme deinking examples, it is also not expressly excluded." FR, page 2. A patent Appellant typically does not state in an example what reagents were not added as that list would be infinite in length. Rather, a patent Appellant typically sets forth what reagents were added. The fact that appellants did not explicitly state that alkali was not added in the examples is of no consequence in the written description analysis. As set forth above, the specification clearly states that one aspect of claimed methods is that alkali is not added.

The examiner sets forth another position in support of this rejection, stating "[t]he specification only provides for caustic soda (pg. 5, lines 9-11), not elimination of all alkali from the aqueous medium." Advisory Action, (AA), page 3. Again, the examiner is not using the language found in the specification and claims. Page 5, lines 9-11 of the specification states that alkali, not caustic soda, is not required in the present de-inking method. Claim 27 mirrors the language used in the specification of this application. The examiner's comment regarding caustic soda is misplaced.

For these reasons, the rejection of claim 27 under 35 U.S.C. § 112, first paragraph (written description), should be reversed.

ii. *Claim 37 Satisfies the Written Description Requirement*

For the reasons set forth in regard to claim 27, the rejection of claim 37 under 35 U.S.C. § 112, first paragraph (written description), should be reversed.

iii. *Claim 28 Satisfies the Written Description Requirement*

Claim 28 in relevant part requires that the pulping occurs at a wastepaper pulp consistency of about 12% or greater. The examiner states that this limitation lacks written descriptive support because "[t]he highest consistency disclosed is 15%." FR, page 7.

The portion of the specification that the examiner is apparently referring to, page 6, lines 2-3 ("high consistency pulper (consistency 2-15%)"), is set forth in the portion of the specification denominated "Description of the Preferred Embodiments." Thus, this passage is not the broadest disclosure of the present invention and claim 28 should not be artificially narrowed to a preferred embodiment.

The present invention is broadly disclosed as a deinking method that uses the biological activity of enzymes. *See, e.g.*, specification, page 5, lines 1-14. This broad disclosure of the invention places no limitation on the consistency at which the waste paper is to be pulped. Further evidence that appellants were in possession of a broader invention that placed no upper limit on the consistency at which the waste paper is to be pulped is found in the original claims. For example, the pulping step of original claim 1 placed no upper or lower limit on the consistency to be used in that step. This is clear evidence that appellants were in possession of the invention now set forth in claim 28.

The examiner notes that the consistency range set forth in this claim "could be construed to include dry comminution, which is clearly not supported by the specification." FR, page 2. In making this comment, the examiner fails to read claim 28 as a whole. Claim 28 depends from claim 21. The method set forth in claim 21 calls for pulping waste printed paper in an aqueous

medium. Thus, while claim 28 does not set forth an explicit numerical upper end for the consistency range, the claim is limited to pulping the waste printed paper in an aqueous medium per the requirements of claim 21. Therefore, the examiner's concern that claim 28 includes dry comminution is misplaced.

For these reasons, the rejection of claim 28 under 35 U.S.C. § 112, first paragraph (written description), should be reversed.

(b) Rejections Under 35 U.S.C. § 103

Legal Standard

Obviousness is a legal conclusion based on underlying facts of four general types, all of which must be considered by the examiner: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of nonobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459 (1966). Furthermore, the "[d]etermination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention." *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546, 48 USPQ2d 1321, 1329 (Fed. Cir. 1998). Rather, there must be a teaching or suggestion within the prior art, within the nature of the problem to be solved, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources, to select particular elements, and to combine them as combined by the inventor. *See Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 665, 57 USPQ2d 1161, 1167 (Fed. Cir. 2000); *ATD Corp.*, 159 F.3d at 546, 48 USPQ2d at 1329; *Heidelberger Druckmaschinen AG v. Hantscho Commercial Prods., Inc.*, 21

F.3d 1068, 1072, 30 USPQ2d 1377, 1379 (Fed. Cir. 1994) ("When the patented invention is made by combining known components to achieve a new system, the prior art must provide a suggestion or motivation to make such a combination."). As stated in *In re Kotzab*, 217 F.3d 1365, 1369, 55 USPQ2d 1313, 1316 (Fed. Cir. 2000):

> A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See [In re] *Dembiczak*, 175 F.3d 994 at 999, 50 U.S.P.Q.2d [1614] at 1617 [Fed. Cir.1999]. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983)).

Analysis

i. Claim 21 is not obvious *under 35 U.S.C. § 103(a) over Japanese Application 59-9299 (JP '299)*[1] *in view of U.S. Patent 4,923,565 (Fuentes)*[2]

By way of review, claim 21 sets forth a method of de-inking waste printed paper comprising pulping the waste printed paper at a pH between 3 and 8 with an enzyme capable of dislodging ink particles in an aqueous medium at a pH between 3 and 8. The ink is dislodged from the waste printed paper by action of the enzyme and the dislodged ink particles are removed from the resulting pulp containing medium. The examiner believes that the combined disclosures of JP '299 and Fuentes would have rendered the subject matter of claim 21 as a whole obvious to a person of ordinary skill in the art. Appellants respectfully disagree.

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[1] Appellants' consideration of JP '299 is based upon the record copy English translation of the Japanese language document.

[2] As explained above, claim 47 depends from canceled claim 41 and was inadvertently not canceled with claim 41. The appeal has been withdrawn as to claim 47 and claim 47 will be formally canceled at an appropriate time at the conclusion of these appeal proceedings.

Here, it is believed the examiner has impermissibly used appellants' disclosure of the claimed method of enzymatically de-inking as a road map in order to combine the disparate features of JP '299 and Fuentes in an attempt to arrive at the subject matter of claim 21.

JP '299 and Fuentes do not establish a prima facie case of obviousness

JP '299 does describe a method of de-inking waste paper using a cellulase enzyme. JP '299, page 2. Any cellulase may be used but it is preferred to use "[a]lkaline cellulase...having optimum pH 8.0-11.5 (preferably 8.1-11.0). *Id.*, paragraph bridging pages 2-3. JP '299 also states that "solvent, acid, alkali etc. can be added provided it does not impair the effect of this invention." *Id.* page 4.

JP '299 exemplifies the claimed method by way of a series of experiments described in the specification and a series of comparative experiments. JP '299, Examples 1-3. In each experiment, 1.0% (relative to old paper) sodium hydroxide is used. *Id.* Howard Kaplan, an employee of Enzymatic Deinking Technologies (EDT), the licensee of the present patent application, has submitted two declarations under 37 CFR § 1.132 that compare results obtained from experiments designed to track the method of Example 2 of JP '299 and the method of claim 21 under appeal. The first Kaplan declaration (Kaplan I) was filed with the response of November 22, 2004. The second Kaplan declaration (Kaplan II) was initially submitted in unexecuted form on February, 16, 2006, with an executed copy submitted on February 24, 2006. While the Kaplan declarations will be discussed in detail *infra*, they are relevant to the present discussion as the declarations establish that pulping waste paper in the presence of 1 % by weight

relative to the waste paper of NaOH results in a pH of 10.6 (Kaplan I, ¶ 4) or a pH of 11.19 (Kaplan II, ¶ 4). The examiner has not disputed these facts.

Thus, in comparing the disclosure of JP '299 with the subject matter of claim 1, it is seen that JP '299 does not describe performing the de-inking method of that reference at a pH between 3 and 8 as required by claim 21 on appeal. The examiner agrees that JP '299 and claim 21 differ in this way, stating "JP '299 does not expressly disclose that the pulping occurs at a pH between 3 and 8." FR, page 7. The examiner proposes to make up for this missing teaching from JP '299 in two ways. First, the examiner states that "JP '299 discloses that the reference discloses that the enzyme used in [JP '299] can be a commonly occurring cellulase or alkaline cellulase (p. 2, ¶ 6), that acid and alkali can be added (e.g., for adjusting pH; p. 4, ¶ 4), and that the examples provided do not restrict the invention (p.4,¶4)." *Id.* Second, the examiner points out that Fuentes "discloses pulping recycled fibers with cellulase added at a pH between 3 and 7 (col. 3, lines 36-43), and in an example 4.8 (col. 4, lines 38-39), which contains three specific points (3, 4.8, and 7) within the claimed range of between 3 and 8." *Id.*, page 8. For the reasons that follow, neither JP '299 by itself nor in combination with Fuentes establishes a *prima facie* case obviousness against the subject matter of claim 21 considered as a whole.

Neither the disclosure of JP '299 that common or alkaline cellulases may be used in that invention nor the disclosure that acid and alkali can be added suggest that the de-inking process of JP '299 operates at a pH between 3 and 8. It is understood that the examples of JP '299 are not limiting. However a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates,*

Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). Furthermore, "in considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968). As stated by the Federal Circuit, "[w]hat a reference teaches or suggests must be examined in the context of the knowledge, skill, and reasoning ability of a skilled artisan." *Symex (U.S.A) LLC v. Apotex Inc.*, 407 F.3d 1371, 1380, 74 USPQ2d 1823, 1830 (Fed. Cir. 2005).

The facts of record establish that a person skilled in the de-inking art at the time of the present invention would have read JP '299 as teaching that the de-inking method of the reference should be operated at a high alkaline pH, not at a pH between 3 and 8. While not limiting, the examples of JP '299 provide insight into the thinking of those of ordinary skill in the art at the time the present application was filed. Despite measuring the activity of the cellulase used in the examples of the reference at a pH of 6.0, JP '299, page 5, the inventors of JP '299 performed the examples, both the inventive and comparative examples at a high alkaline pH, *i.e.*, 10-11. This fact speaks measures of the thinking of those skilled in the art at the time the present application was filed. If the enzymatic activity was measured at a pH of 6.0, why were the examples operated at a pH of 10-11? The answer to that question is provided by certain of the evidence appellants have introduced into the record.

At the time the present application was filed, persons skilled in this art believed that de-inking methods should not be operated at acid or neutral conditions since "it was thought

alkaline conditions were required to achieve swelling of the fibers necessary to remove ink particles." Declaration of Karl-Erik L. Eriksson filed under 37 CFR § 1.132 (Eriksson declaration), paragraph 5. As explained by Dr. Eriksson:

> Before the description in the above-identified application, it was believed that alkaline conditions were necessary to cause ink containing paper fibers to swell to effect defiberization and deinking by enzymes. Absent alkaline conditions, one would not have expected swelling, and therefore deinking, to occur as a result of the addition of deinking enzymes alone in the pulping process. In the deinking art, there is over twenty years of published detailed studies from commercial, academic, and government laboratories that emphasize that chemical modification and treatment by alkali exposure is essential and necessary for deinking. As a recent example, enclosed is a copy of the Paper and Pulp International (PPI) publication entitled "Neutral Deinking Makes Its Debut", describing the breakthrough in October 1993 of deinking in neutral conditions, without the addition of alkalis such as sodium hydroxide to the pulp prior to or during deinking.
>
> Therefore, to one skill in the art at the time the above-identified application was originally filed, the deinking action of enzymes in a non-alkaline medium would have been both novel and surprising. An expectation of the successful use of deinking enzymes in an aqueous medium having a pH of between about 3 and 8 is not found in the '299 patent. It is my opinion that prior to the invention described in the above-identified patent application, no one skilled in the art would have considered evaluating deinking enzymes alone without the addition of alkalis.

See also, Declaration of Douglas E. Eveleigh, executed April 12, 2004, filed under 37 CFR § 1.132 (Eveleigh I), paragraphs 6 and 7. Special attention should be paid to the PPI document each of Drs. Eriksson and Eveleigh cite and discuss in their respective declarations since PPI documents how neutral de-inking was seen to be a breakthrough as of October 1993, a time later than that of the present invention. PPI confirms what workers in this field knew about de-inking at the time of the present invention, that if NaOH is not used in a de-inking process, other measures, such as efficient fiber-to-fiber friction, must be used to achieve good ink removal.

PPI, second page, first column. The Declaration of Harald Schmid, executed May 7, 2004, filed under 37 CFR § 1.132 (Schmid) confirms that the de-inking process discussed in PPI was designed and operated to run under neutral conditions.

In addition, a second declaration by Dr. Eveleigh, Declaration of Douglas E. Eveleigh, executed March 8, 1996, filed under 37 CFR § 1.132 (Eveleigh II), supports the proposition that prior to the present invention, it was believed by persons of ordinary skill in this art that cellulases could only be used to treat cellulose fibers in conjunction with chemical modification of the cellulose fibers. While Eveleigh II is not directed to JP '299, it is relevant to the present obviousness inquiry as Dr. Eveleigh discussed the history of using enzymes, such as cellulases, to affect cellulolysis. Dr. Eveleigh stated that the state of the art at the time of the present invention was that chemical modification and treatment of cellulose fibers was essential and necessary for efficient cellulolysis. Dr. Eveleigh stated that one of ordinary skill in the art would consider the deinking action of cellulases alone as novel and unusual.

Nor does the disclosure in JP '299 that acid or alkali can be used in that de-inking method help the examiner's case. That disclosure in JP '299 is without any context or direction and is essentially meaningless. It should first be noted that the examiner has misapprehended the disclosure of JP '299 when the examiner states that JP '299 discloses that "acid and alkali can be added (e.g., for adjusting pH; p. 4, ¶ 3)." What JP '299 actually states at that section is that "solvent, acid, alkali etc. can be added provided it does not impair the effect of the invention." *Id.* JP '299 does not, as asserted by the examiner, state that the purpose of adding acid or alkali is to adjust pH. Those words do not appear in that passage. While inventing teachings in the

reference, the examiner ignores the cautionary statement in the passage that solvent, acid, alkali etc. can be used if their use does not impair the effect of the invention. It is incumbent upon the examiner to establish through evidence that solvent, acid, alkali etc. would have been used by a person of ordinary skill in the art in such a manner that the de-inking process of JP '299 would not be impaired. All that is taught by JP '299 in regard to the pH to be used during the de-inking method is found in the examples where a pH in the range of 10-11 is used.

Furthermore, this passage of JP '299 is essentially meaningless as the reference does not provide any guidance as to how much acid or alkali is to be added and for what purpose. Whether the addition of acid and/or alkali to the de-inking method of JP '299 will affect the pH of the aqueous medium to any significant degree will depend upon a multitude of factors including the amount added, other reagents used and their amount. It may be that acid would be used to lower a very high alkaline pH obtained through use of a combination of alkaline reagents to a pH of 10-11 shown to be useful in the examples of JP '299. This is speculation of course but it serves to illustrate the point that the examiner's reliance upon this passage of JP '299 is speculative at best. What is clear is that JP '299 does not teach or suggest that the de-inking method of that reference should be conducted at a pH between 3 and 8 as required by claim 21 on appeal.

When a piece of prior art "suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the Appellant" the piece of prior art is said to "teach away" from the claimed invention. *In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994). This is the case here. There is nothing in JP '299 that

suggests a de-inking method carried out at a pH of between 3 and 8 would be useful. The use of a pH of 10-11 in the examples leads away from the invention of claim 21.

The combined disclosures of JP' 299 and Fuentes do not establish a *prima facie* case of obviousness. Fuentes does describe the use of cellulase enzyme to treat a paper pulp. *Id.*, col. 2, lines 31-53. However, the method of Fuentes does not involve de-inking. Rather, Fuentes treats a pulp having a high SR with cellulase to lower the SR without having an undesirable effect on the mechanical strength of the paper manufactured from the pulp. *Id.*, col. 2, lines 44-47. Fuentes states that the pH of that process is preferably between 3 and 7 to avoid denaturing the enzymes. *Id.*, col. 3, lines 36-43. The pulp to be treated in Fuentes may contain recycled fibers. *Id.* col. 2, lines 48-53.

The last two teachings of Fuentes need to be put in proper perspective. Example 1 of Fuentes is instructive here. In this example a paper pulp that included recycled cardboard cartons was treated with sulphuric acid to adjust the pH of the suspension to 4.8. Neither the method described in Fuentes nor Example 1 of Fuentes is a de-inking method as required by claim 21 on appeal or as set forth in JP '299. Rather, the method of Fuentes can use the fibers produced by a de-inking process, *i.e.*, recycled fibers. Thus, Fuentes and JP '299 describe two disparate, separate and distinct processes. A person of skill in the art would not look to Fuentes for insight in regard to de-inking waste paper.

If anything, Fuentes teaches away from conducting the de-inking process of JP '299 at a pH between 3 and 8. As mentioned, Fuentes prefers to operate that process at a pH between 3 and 7 to avoid denaturing the enzyme. One can speculate that is why JP '299 measured the

enzymatic activity of the cellulase used in the examples at a pH of 6.0. Regardless, the fact remains that the only specific guidance set forth in JP '299 as to the pH to be used in that de-inking method, the examples, tells the person of ordinary skill in the art to conduct a de-inking method at a pH of 10-11 despite having measured the activity of the cellulase at a pH of 6.0. Assuming the teachings of Fuentes in regard to its concern about denaturing the enzyme if a pH higher than between 3 and 7 is used would be viewed by a person of ordinary skill in the art as being relevant to a de-inking method, that hypothetical person would understand from reading JP '299 that enzyme denaturation is not a concern in a de-inking method since JP '299 proceeds to use cellulase in a de-inking method using a pH of 10-11.

The examiner notes that JP '299 states that common cellulases may be used and that alkaline cellulases are only preferred. FR, page 3. This is correct. However, this general disclosure does not suggest that the de-inking method of JP '299 is to be performed at a pH between 3 and 8. As developed above, JP '299 measured the enzymatic activity of the cellulase used in the examples at a pH of 6.0 and then proceeded to use that enzyme in a method where the pH of the aqueous medium was 10-11. Regardless of the activity range or optimal activity of a cellulase, JP '299 points the skilled artisan to conduct the de-inking method under high alkaline conditions, (pH 10-11).

The examiner admits that the rejection is not premised upon JP '299 suggesting that cellulases can be used in that invention over their entire range of activity but rather, Fuentes is relied upon to provide the pH range for the rejection. FR, page 3.

The examiner also notes that "[d]efiberization or pulping, is recited as the first step in claims 21 and 31 [and] Fuentes was applied to show a pulping step under pH conditions within the claimed pH conditions, using enzymes capable of dislodging ink particles." AA, page 3. To equate the pulping step of Fuentes with the pulping step of JP '299 or the present invention is comparing apples with oranges. As developed above, the pulping step of Fuentes is for the purpose of defiberizing the pulp suspension to improve the suspension's SR value. Fuentes is not involved with de-inking. Thus, while Fuentes does pulp recycled fibers in the presence of an enzyme at a pH between 3 and 7, that process has nothing to do with de-inking and does not provide the requisite reason, suggestion or motivation to modify JP '299 in any manner.

For the reasons set forth above, the examiner's rejection should be reversed.

Appellants' evidence of non-obviousness

After evidence or argument is submitted by the Appellant in response to an obviousness rejection, "patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of the argument." *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); see *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787 (Fed. Cir. 1984) ("All evidence on the question of obviousness must be considered, both that supporting and that rebutting the prima facie case."). "If rebuttal evidence of adequate weight is produced, the holding of *prima facie* obviousness, being but a legal inference from previously uncontradicted evidence, is dissipated. Regardless of whether the *prima facie* case could have been characterized as strong or weak, the examiner must consider all of the evidence anew." *Piasecki, supra.*

Appellants rely upon the following declarations filed under 37 CFR § 1.132 as evidence of non-obviousness:

- Kaplan I
- Kaplan II
- Eriksson
- Eveleigh I
- Eveleigh II
- Schmid

Eriksson, Eveleigh I and II, and Schmid are discussed above in relation to the *prima* facie case and serve to undermine the examiner's stated facts and reasons in support thereof. Kaplan I and II describe the results obtained from a series of comparative tests that establish de-inking waste printed paper according to the present invention where an enzyme is used at a pH between 3 and 8 unexpectedly improves the brightness of the treated pulp (Paper L-value) and the whiteness of the filtrate (Filtrate L-value) compared with a de-inking method that uses an enzyme and 1% NaOH.

As explained by Mr. Kaplan, the results show that treatment at lower pH was more effective than the treatment at the higher pH, in the presence of 1% NaOH. Kaplan I, ¶ 7, Kaplan II, ¶ 7. The demonstrated results are relevant in the real world as the increased whiteness means that less bleach is used. .Kaplan II, ¶ 7. In addition Mr. Kaplan states that the superior results

obtained without NaOH significantly reduces the cost of the method as the operator does not incur the cost of NaOH. Kaplan I, ¶ 8; Kaplan II, ¶ 8.

In considering the results set forth in Kaplan I and II, it should be kept in mind that "[o]bviousness does not require absolute predictability of success. Indeed, for many inventions that seem quite obvious, there is no absolute predictability of success until the invention is reduced to practice. There is always at least a possibility of unexpected results, that would then provide an objective basis for showing that the invention, although apparently obvious, was in law nonobvious." *In re O'Farrell*, 853 F.2d 894, 903, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988). This is the case here, *i.e.*, the record evidence of non-obviousness provides an objective basis to conclude that the present invention is non-obvious.

The examiner criticized Kaplan II, stating that the showing is not commensurate in scope with the claims and does not compare the claimed subject matter with the closest prior art. FR, page 5.

Prior to discussing the examiner's specific criticisms of Kaplan II, it should be noted that Kaplan II is not the only evidence of non-obviousness relied upon by appellants. Considering the evidence in piecemeal fashion is legal error. *Piasecki, supra.* Just as examiners admonish that references relied upon in support of an obviousness rejection must be considered together and not individually, the law is equally clear that rebuttal evidence must be considered in its entirety not piece-by-piece and evaluated individually for its knockdown value. *Id.* Thus, the

examiner needs to take a step back and reevaluate the conclusion of obviousness in light of all the evidence of record, not just Kaplan II.

The examiner first states that "[t]he data provided in [Kaplan II] provides evidence for only a limited range (approximately 7.44 to 7.66) and does not provide evidence that would lead one of ordinary skill in the art to determine a trend for the rest of the claimed range." FR, page 5. The examiner also states that the test data in Kaplan II representative of JP '299 is based upon a "preferred embodiment" and that JP '299 states that commonly occurring cellulases can be used without restriction. FR, pages 5-6. The examiner once again relies upon the statement in JP '299 that acid and alkali can be used, "clearly suggesting that the invention is *not* restricted to the examples." FR, page 6. The examiner concludes that "JP '299 is not limited to alkaline deinking or to adding NaOH to the process." *Id.* The examiner's criticisms are misplaced.

In preparing comparative evidence, a patent Appellant can only be reasonably held to comparing with what the reference explicitly describes, not what a patent examiner subjectively believes the reference suggests. Here, the statement in JP '299 that acid or alkali can be used is too general and is not reasonably suggestive of anything. JP '299 does not state how much acid or alkali can be used or for what purpose. The only objective guidance given in JP '299 in this regard is found in the examples where 1% NaOH was used. To hold that the general statement in JP '299 that acid or alkali means that appellants should test their invention against a supposed embodiment of JP '299 that uses a pH between 3 and 8 is in essence a requirement that appellants test their invention against their invention. Here, the examiner agrees that JP '299 does not teach or suggest that that method be operated at a pH between 3 and 8 as the rejection is

obviousness, not anticipation, and Fuentes is explicitly relied upon by the examiner for its disclosure of using cellulase to treat cellulose fibers at a pH between 3 and 7 in the presence of an enzyme. Thus, the comparison set forth in Kaplan II, as well as Kaplan I, is a comparison with the closest prior art.

The examiner's criticism that the data in Kaplan II is for a limited range and would not allow a person of ordinary skill in the art to determine a trend is without factual support. The tests set forth in Kaplan II compare the inventive de-inking method at the upper end of the claimed pH range with the only objective guidance given in JP '299 in regard to pH. With appellants having presented objective rebuttal evidence, the burden is shifted to the examiner to present fact-based reasons why the rebuttal evidence is insufficient. Just as examiners admonish that unsupported attorney argument is not persuasive, a patent examiner's unsupported argument is equally unpersuasive.

The examiner also notes that the experiments set forth in Kaplan II representative of JP '299 used a different cellulase than used in the experiments representing the invention and that the "brightness difference between the two sets of experiments may be due to a more effective cellulase being used to represent the claimed invention. FR, page 6. As explained by Mr. Kaplan, none of the enzymes described at page 3 of JP '299 were available. Kaplan II, ¶ 5. The examiner has not provided a fact-based statement why the enzymes chosen by Mr. Kaplan are not representative of the specific teachings of JP '299 and of the present de-inking method. The examiner's statement that the difference in the brightness data may be due to a more effective cellulase being used to represent the claimed invention is unsupported by any evidence.

Taking a step back and weighing the evidence of obviousness relied upon by the examiner against the evidence of non-obviousness relied upon appellants, it is believed that the clear weight of the evidence is in favor of appellants. JP '299 would be read by a person of ordinary skill in the de-inking art in the context of the state of the art of this field at the time of the present invention. This means that the person of ordinary skill in the art would have understood that de-inking according to JP '299 would take place at a pH higher than between 3 and 8, such as 10-11 as used in the examples of the reference, since the art considered high pH essential to fiber swelling in order to remove ink particles (Eriksson, Eveleigh I). The general statement in JP '299 that acid or alkali can be used in that invention is too general to have any meaning to a person of ordinary skill in the art. The only guidance JP '299 sets forth for the use of such chemicals is in the examples where 1% NaOH is used (pH 10-11). Fuentes is directed to a separate method of pulping cellulose fibers and is not directed to de-inking. Thus, its evidentiary value as used in the examiner's rejection is minimal, if at all relevant to the present obviousness inquiry.

In contrast to the weak evidence of obviousness relied upon by the examiner, appellants have relied upon substantial evidence of non-obviousness that undermines the factual support of the examiner's rejection as well as establishing that the present method of de-inking unexpectedly improves the brightness of the fibers. The greater weight of the evidence lies in appellants' favor and reversal of the obviousness rejection of claim 21 is earnestly solicited.

ii. Claims 22-27, 30, 45 and 48-50 are not Obvious Over JP '299 and Fuentes

Claims 22-27, 30, 45 and 48-50 depend either directly or indirectly from claim 21. For the purposes of this appeal alone, no separate argument is presented in regard to these dependent claims. Thus, their patentability will stand or fall with claim 21.

iii. Claim 31 is not obvious over JP '299 and Fuentes and in further view of U.S. Patent 4,548,674 (Hageman)

By way of review, claim 31 is similar to claim 21 and sets forth a method of de-inking waste printed paper comprising pulping the waste printed paper at a pH between 3 and 8 with an enzyme capable of dislodging ink particles in an aqueous medium at a pH between 3 and 8. The ink is dislodged from the waste printed paper by action of the enzyme and the dislodged ink particles are removed from the resulting pulp containing medium. Claim 31 additionally requires that the pulping occur at high waste paper consistency. The examiner believes that the combined disclosures of JP '299, Fuentes and Hageman would have rendered the subject matter of claim 31 as a whole obvious to a person of ordinary skill in the art. Appellants respectfully disagree.

Appellants have explained above why the basic combination of references used by the examiner, JP '299 and Fuentes, do not render the subject matter of claim 21 obvious. Appellants renew and incorporate by reference herein the arguments made in regard to claim 21. Hageman is relied upon by the examiner only to show "pulping wastepaper at consistencies of 1-50%." FR, page 10. For the purposes of this appeal, appellants do not dispute that it would have been obvious to use a high pulping consistency in JP '299. Rather, it is appellants' position that

Hageman does not make up for the shortcomings of JP '299 and Fuentes and that the three references considered individually or together do not render the subject matter of claim 31 obvious for the reasons set forth above in regard to claim 21.

iv. ***Claims 28, 32-38, 40, 42-44 and 46 are not obvious over JP '299 and Fuentes and in further view of U.S. Patent 4,548,674 (Hageman)***

Claim 28 depends from claim 21 and claims 32-38, 40, 42-44 and 46 depend directly or indirectly from claim 31. All of these claims require the use of a high wastepaper pulping consistency. For the purposes of this appeal only, no separate argument is made for the patentability of these dependent claims. Thus, they stand or fall with the patentability of claims 21 and 31.

(8) SUMMARY AND CONCLUSION

For the foregoing reasons, Appellants submits that claims 21-28, 30-38, 40, and 42-50 are patentable.

Respectfully submitted,

/Patrea L. Pabst/
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Reg. No. 31,284

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Claims Appendix: Claims On Appeal

21. A method of de-inking waste printed paper, comprising

a) pulping at a pH between 3 and 8 waste printed paper with an enzyme capable of dislodging ink particles from the waste printed paper in an aqueous medium at a pH between 3 and 8, wherein ink is dislodged from the waste printed paper by action of the enzyme; and

b) removing the dislodged ink particles from the resulting pulp containing medium.

22. The method of Claim 21 wherein dislodged ink particles are removed by flotation.

23. The method of Claim 21 wherein dislodged ink particles are removed by washing.

24. The method of Claim 21 wherein the amount of enzyme used is in the range of 0.005 to 5 percent-by-weight based on the dry weight of the wastepaper.

25. The method of Claim 21, wherein said enzyme is selected from the class consisting of cellulases, pectinases, and mixtures thereof.

26. The method of Claim 21 wherein said enzyme is selected from the group consisting of cellulases derived from *Trichoderma viride*, *Aspergillus niger*, hemicellulases, other carbohydrases and mixtures thereof.

27. The method of Claim 21 wherein alkali is not added to the aqueous medium.

28. The method of Claim 21 wherein the pulping occurs at a wastepaper pulp consistency of about 12% or greater.

30. The method of Claim 21 wherein the temperature of the pulping is in a range of from room temperature up to about 60C.

31. A method of recycling waste printed paper, comprising:

a) pulping waste printed paper;

b) contacting at a pH between 3 and 8 waste printed paper at high wastepaper pulping consistency with an enzyme capable of dislodging ink particles from the waste printed paper in an aqueous medium at a pH between 3 and 8, wherein ink is dislodged from the waste printed paper by action of the enzyme; and

c) removing dislodged ink particles from the resulting pulp containing medium.

32. The method of Claim 31, wherein the enzyme is a cellulase selected from the group of cellulases derived from *Trichoderma viride*, *Aspergillus niger* or mixtures thereof wherein the cellulase is used in an amount between 0.005 and 5.0 percent-by-weight based on the dry weight of the waste printed paper, the contacting being carried out at a temperature between room temperature and about 60°C.

33. The method of Claim 31 wherein the amount of enzyme used is in the range of 0.005 to 5 percent-by-weight based on the dry weight of the wastepaper.

34. The method of Claim 31 wherein said enzyme is selected from the class consisting of cellulose, pectinase, and mixtures thereof.

35. The method of Claim 31 wherein said enzyme is a cellulase-selected from the group consisting of cellulases derived from *Trichoderma viride*, *Aspergillus niger*, hemicellulases, other carbohydrases and mixtures thereof.

36. The method of Claim 31 wherein the ink particles are removed by flotation or washing.

37. The method of Claim 31 wherein alkali is not added to the aqueous medium.

38. The method of Claim 31 wherein the pulping occurs at a wastepaper pulp consistency of between 12% and 15%.

40. The method of Claim 31 wherein the temperature of the pulping is in a range of from room temperature up to about 60C.

42. The method of claim 31 wherein the enzyme enhances removal of materials selected from the group consisting of heavily coated inks, highly polymerized inks, non-impact inks, and cured polymer resins.

43. The method of claim 42 wherein the enzyme is effective to enhance removal of cured polymer resins.

44. The method of claim 31 wherein the enzyme is effective to debond fiber bonding.

45. The method of claim 25 wherein the enzyme degrades by enzymatic hydrolysis.

46. The method of claim 31 wherein the enzyme degrades by enzymatic hydrolysis.

47. The method of claim 41 wherein the enzyme degrades by enzymatic hydrolysis.

48. The method of claim 21 wherein the enzyme is an acid resistant cellulase.

49. The method of claim 21 wherein the wastepaper is disintegrated in a conventional pulper.

50. The method of claim 49 wherein the consistency of the pulp in the conventional pulper is between 4 and 7%.

Evidence Appendix

1. Declaration of Mr. Howard Kaplan dated November 22, 2004
2. Declaration of Mr. Howard Kaplan dated February 22, 2006
3. Declaration of Dr. Karl-Erik Eriksson dated March 19, 2004
4. Declaration of Dr. Douglas Eveleigh dated April 12, 2004
5. Declaration of Dr. Douglas Eveleigh dated March 8, 1996
6. "Neutral Deinking Makes Its Debut", *Pulp and Paper International*, October, 1993
7. Declaration of Mr. Harald Schmid dated May 7, 2004

EXHIBIT
1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Steven Say-kyoun Ow and Tae Jin Eom

Serial No. 09/121,152 Art Unit: 1731

Filed: May 6, 1994 Examiner: Steve Alvo

For: Biological De-Inking Method

DECLARATION UNDER 37 C.F.R. 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Howard Kaplan, hereby declare that:

1. I am employed at Enzymatic Deinking Technologies, Norcross, GA, as its chief operating officer. Enzymatic Deinking Technologies is the licensee of the above-identified patent application.

2. I instructed my laboratory manager, Jian Hua Ma, to conduct experiments to compare the deinking of recycled paper using the conditions described in example 2 of Japanese patent application No. 59-9299 ("the JPA") and the above-identified patent application.

3. I reviewed JPA to determine the conditions and materials described therein for the enzyme enhanced deinking of recycled paper. The only conditions were described in the examples. Example 1 added a number of materials other than an enzyme and NaOH. Example 2 examined the effect of adding 1% by weight NaOH and an alkaline cellulase. It was my understanding that the examiner preferred we use the conditions of Example 2 so that there would be fewer variables. We therefore conducted a comparison of the deinking of recycled

paper as described in example 2, with the claimed method which requires a pH of less than 8, differing in the pH of the reaction mixtures and the cellulases which were added.

4. Example 2 does not provide a pH of the reaction mixture but instead refers to adding 1% (relative to the old newspaper) NaOH. This creates a pH of 10.6. For purposes of comparison, NaOH was not added to the reaction mixture of the claimed method. The pH of the reaction mixture was 7.2.

5. It was not possible to obtain any of the enzymes described at page 3 of the JPA. We contacted Amano Pharmaceutical Co. and tried to locate Ueda Kagaku, who are listed as the manufacturers. We also searched a number of catalogs and on the internet. Amano did not sell the named enzyme and Ueda appears to be out of business. We then obtained an equivalent alkaline cellulase from Meiji Seika, HEP-100, an alkaline cellulase which is active over a range of at least 4.0 to 10.0, with a pH optimum of 8.0. For purposes of comparison, a neutral cellulase was obtained from Novozymes, Novozym 342 produced by the fungus Humicola insolens, which has an optimum pH of between 6.5 and 7.5.

6. As described in Example 2 of the JPA, each reaction mixture contained old newspapers, cut in 2 x 5 cm pieces, fed into a laboratory disintegrator, water and, for the JPA study, 1.0% NaOH, relative to raw material old paper, and disintegration done at pulp concentration 5%, 40°C for 20 minutes. After disintegration, 0.2% enzyme relative to raw material old paper as described in example 2 was added to the mixture containing the 1% NaOH and an equivalent amount of enzyme added to the other reaction mixture, and stirring was done at 45°C for one hour. The pulped material was then concentrated to 15% pulp concentration, diluted to 1% by

added water, and filtered through a Buchner funnel. The paper in the funnel and the filtrate were then analyzed.

7. The whiteness of the treated pulp (L-value) and the whiteness of the removed liquid (L-value) were determined for paper and filtrates from both samples.

The results showed that the treatment at the lower pH was more effective than the treatment at the higher pH, despite the use of the 1% NaOH to swell the cellulose fibers and release the ink in the paper as well as the use of a cellulase.

	Paper L-value	Filtrate L-value
JPA sample with 1% NaOH	65.9%	60.6%
Ow sample at pH 7.2	66.6%	56.8%

8. Not only were the results superior without NaOH treatment, but the cost of the treatment in the absence of the NaOH is reduced since NaOH costs about $300/ton on a 50% basis.

9. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements are punishable by fine or imprisonment or both under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the above-identified patent application or any patent issuing thereon.

Date:

Howard Kaplan

EXHIBIT
2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Steve Say-Kyoun Ow and Tae Jin Eom

Serial No.: 09/121,152 Art Unit: 1731

Filed: July 22, 1998 Examiner: Anna Kinney

For: *BIOLOGICAL DEINKING METHOD*

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. § 1.132

Sir:

I, Howard Kaplan, hereby declare that:

1. I am employed at Enzymatic Deinking Technologies, Norcross, GA, as its chief operating officer. Enzymatic Deinking Technologies is the licensee of the above-identified patent application.

2. I instructed my laboratory manager, Jian Hua Ma, to conduct experiments to compare the deinking of recycled paper using the conditions described in Example 2 of Japanese Patent Application No. 59-9299 ("JP '299") and the above-identified application.

3. I reviewed JP '299 to determine the conditions and materials described therein for the enzyme enhanced deinking of recycled paper. The only conditions were described in the examples. Example 1 added a number of materials other than an enzyme and NaOH. Example 2 examined the effect of adding 1% by weight NaOH and an alkaline cellulase. It was my

understanding that the examiner preferred we use the conditions of Example 2 so that there would be fewer variables. We therefore conducted a comparison of the deinking of recycled paper as described in example 2, with the claimed method which requires a pH of less than 8, differing in the pH of the reaction mixtures and the cellulases which were added. Each experiment was performed 10 times to provide a statistically valid result. The results of the experiments are enclosed.

4. Example 2 of JP '299 does not provide a pH of the reaction mixture but instead refers to adding 1% (relative to the old newspaper) NaOH. The average pH of the mixture after caustic addition was 11.19. The average pH of the mixture after disintegration was 11.12. The average pH of the mixture after addition of the enzyme was 11.16 and the average pH of the mixture after stirring was 10.67. Each deinking example with 1% NaOH relative to wastepaper produces pHs in excess of 10.59. For purposes of comparison, NaOH was not added to the reaction mixture of the claimed method. The average pH of the reaction mixture after stirring was 7.5 and none were above 7.6.

5. It was not possible to obtain any of the enzymes described at page 3 of the JPA. We contacted Amano Pharmaceutical Co. and tried to locate Ueda Kagaku, listed as the manufacturers. We also searched a number of catalogs and on the internet. Amano did not sell the named enzyme and Ueda appears to be out of business. We then obtained an equivalent alkaline cellulase from Meiji Seika, HEP-100, an alkaline cellulase which is active over a range of at least 4.0 to 10.0, with a pH optimum of 8.0. For purposes of comparison, a neutral cellulase

was obtained from Novozymes, Novozym 342 produced by the fungus *Humicola insolens*, which has an optimum pH of between 6.5 and 7.5.

6. As described in Example 2 of JP '299, each reaction mixture contained old newspapers, cut in 2 x 5 cm pieces, fed into a laboratory disintegrator, water and, for the JP '299 study, 1.0% NaOH, relative to raw material old paper, and disintegration done at pulp concentration 5%, 40°C for 20 minutes. After disintegration, 0.2% enzyme relative to raw material old paper as described in example 2 was added to the mixture containing the 1% NaOH and an equivalent amount of enzyme added to the other reaction mixture, and stirring was done at 45°C for one hour. The pulped material was then concentrated to 15% pulp concentration, diluted to 1% by adding water, and filtered through a Buchner funnel. The paper in the funnel and the filtrate were then analyzed.

7. The whiteness of the treated pulp (L-value) and the whiteness of the removed liquid (L-value) were determined for paper and filtrates from both samples.

The results showed that the treatment at the lower pH was more effective than the treatment at the higher pH, in the presence of 1% NaOH. The whiteness of the claimed method was 2.2% higher than the JP '299 method. This increase in whiteness is material to deinking paper mills and would allow for less bleach consumption. It is also true that the measurement of the filtrate is higher with the claimed method, indicating more ink is removed with neutral enzymatic deinking.

	Paper L-value	Filtrate L-value
JPA sample with 1% NaOH	65.9%	60.0%
Ow sample at pH 7.2	68.1%	56.4%

8. Not only were the results superior without NaOH treatment, but the cost of the treatment in the absence of the NaOH is reduced since the price of NaOH, at the time the application was filed, was about $400/ton. The absence of 1% NaOH in the claimed method would create a savings of approximately $4.00/ton at the time the application was filed, or approximately $6.80/ton today (See the attached abstract which discloses the price of caustic soda from 1988-1991). Mills typically process eight hundred tons per day, for a cost savings at the time the application was filed of $3200/day, and operate 350 days/year year, leading to a cost savings of $1.12 million/year as of the time this application was filed, or $1.9 million today.

9. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements are punishable by fine or imprisonment or both under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the above-identified patent application or any patent issuing thereon.

Date: 2/22/06

Howard Kaplan

Effect of caustic and enzymes on pulp and filtrate whiteness with mixed ONP

12/8/2005

	Caustic with alkaline enzyme											
Exp. #	1	2	3	4	5	6	7	8	9	10	Average	Standard Deviation
NaOH, %	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
Alkaline MEIJI HEP100, %	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
pH water	7.15	7.22	7.23	7.23	7.19	7.20	7.14	7.21	7.23	7.16	7.19	0.05
pH paper + water	7.18	7.17	7.16	7.20	7.15	7.23	7.18	7.24	7.25	7.17	7.19	0.04
pH after caustic addition	11.22	11.23	11.22	11.22	11.24	11.20	11.18	11.05	11.14	11.15	11.19	0.06
pH after disintegration	11.16	11.12	11.15	11.14	11.10	11.08	11.04	11.07	11.21	11.12	11.12	0.05
pH w/enzymes addition	11.14	11.19	11.16	11.24	11.20	11.13	11.16	11.04	11.09	11.22	11.16	0.05
pH final after stirring	10.70	10.67	10.70	10.69	10.65	10.63	10.59	10.62	10.76	10.67	10.67	0.05
Pulp whiteness, %	66.00	66.01	66.23	65.88	65.99	65.62	65.43	65.90	66.21	65.47	65.87	0.28
Filtrate whiteness, %	60.80	60.35	58.60	59.94	60.10	61.00	58.13	59.23	59.60	62.10	59.99	1.17

	Enzyme only											
Exp. #	11	12	13	14	15	16	17	18	19	20	Average	Standard Deviation
Novozymes SP342, %	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
pH water	7.16	7.18	7.15	7.20	7.17	7.16	7.18	7.16	7.15	7.16	7.17	0.01
pH paper + water	7.09	7.13	7.15	7.12	7.20	7.09	7.13	7.09	7.13	7.13	7.12	0.04
pH after disintegration	7.39	7.35	7.43	7.39	7.32	7.43	7.39	7.43	7.39	7.38	7.39	0.04
pH w/enzymes addition	7.39	7.36	7.43	7.39	7.32	7.42	7.40	7.43	7.39	7.39	7.39	0.03
pH final after stirring	7.51	7.47	7.55	7.51	7.44	7.55	7.51	7.55	7.51	7.50	7.51	0.04
Pulp whiteness, %	68.10	67.73	68.43	67.95	68.12	67.89	68.03	67.76	68.34	68.13	68.05	0.23
Filtrate whiteness, %	57.46	56.90	55.08	54.84	58.52	57.23	58.23	55.78	56.72	54.75	56.35	1.24

Procedures:

This set of tests was conducted following the procedures in the Example 2 in JP-A 59-323.

Mixed ONP was shredded into 2X5 cm pieces, 100 g was fed into a laboratory disintegrator with water and sodium hydroxide, the disintegration was done at about 5.0%, 40C for 20minutes. After disintegration, 0.2% (based OD fiber) enzymes was added, and stirring was done at 45C for 1 hour. It was then concentrated to about 15% pulp consistency, diluted to 1% by adding water, and pulp sheet was made in a Buchner funnel. When the pulp was concentrated, the removed liquid was kept at 5C for 12 hours, and 200 ml of supernatant was taken out and the L value was measured.

Comments:

The tests were performed with mixed ONP collected around Metro Atlanta area in December 2005, which has high inherent whiteness than Asian ONP. The results from these tests shall be different from all previous tests in terms of whiteness gain and ink removal before and after treatment, however the relationship between with and without caustic, or at different pH shall be very similar.

1.0% NaOH shifted the pH from 7.1~7.2 to 11.2, and the final pH dropped slightly with NaOH due to fiber absorption of alkalinity; and the final pH increased without NaOH due to chemicals leaching from paper/fibers to the suspension. Enzymes showed no impact on pH of the fiber suspension.

RESEARCH REPORT

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47 of 48
Previous Next

Chlor-alkali prices: caustic rollercoaster.

10-10 TCD1010008602 NDN-094-0007-3638-2 Elsevier *Elsevier*

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Since chlorine and caustic soda are made together in nearly equal amounts, their prices traditionally waxed and wained in opposing cycles. In general, when caustic soda was in demand, its price rose, but the extra chlorine produced was not wanted, so its price fell, and vice versa. However, the constancy of caustic prices in 1987 was believed to mark a fundamental change in this cycle and the greater demand for caustic was expected to control prices more than chlorine from then onwards (chlorine has fallen out of favour on environmental grounds). The theory has been thrown into confusion by the fact that caustic prices have dropped sharply over the past 2 years. Spot prices for caustic soda in Western Europe have fallen to around $ 50/tonne from about $ 400/tonne in 1988-1991. Chlorine demand in Western Europe has also fallen from a peak of 10,000 tonnes/y in 1989 to only 8500 tonnes/y now. The fall in demand for caustic soda has been attributed to reduced inter-regional deep-sea trade and to the fall in demand for caustic from alumina producers. Spot prices for caustic soda are expected to move sharply upwards in 1995 when the alumina market has settled down and to continue to rise up to the year 2000.

descriptor-chemical businesses generally; trends - general
general industrial code-MS-00; TR-40

cas substance name-chlorine
sic code-2812
cas registry number-7782-50-5
country-Western Europe
country code-11000
business term-market
fact date-1989-1994

cas substance name-caustic soda
sic code-2812
cas registry number-1310-73-2
country-Western Europe
country code-11000
business term-pricing
fact date-1988-1994

EXHIBIT 3

Patents

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Ow et al.

Serial No.: 09/121,152 — Art Unit: 1731

Filed: May 6, 1994 — Examiner: Steve Alvo

For: BIOLOGICAL DE-INKING METHOD

DECLARATION OF KARL-ERIK L. ERIKSSON, PH.D. UNDER 37 CFR § 1.132

KARL-ERIK L. ERIKSSON, PH.D., declares as follows:

1. I earned a Dr. Sci. in biochemistry in 1967. Subsequently, I have conducted extensive research in the fields of enzymology, microbiology and biochemistry at the Swedish Forest Products Research Laboratory and as a Professor of Biochemistry and Eminent Scholar at the University of Georgia, Athens, Georgia. I currently am working in Sweden and am involved with several organizations involved with the commercialization of biological-based innovations in the pulp and paper industry. Attached is a copy of my Curriculum Vitae.

2. My declaration is based on my scientific experience and understanding of the subject matter as an expert in the art. I am familiar with the invention described in the above-identified patent application regarding the novel use of deinking enzymes under non-alkaline conditions. For the record, I have a small economic interest in the business concern that has licensed the subject invention .

3. I have read the English translation of Japanese Patent 59-9299 ('299 patent). In my expert opinion, the '299 patent, read in its entirety, teaches one of ordinary skill in the art only the successful use of deinking enzymes with alkaline deinking chemicals. It is my opinion that the data provided in the '299 patent, taken together with the knowledge of one skilled in the art prior to the priority date of the present application of May 16, 1989, does not provide an expectation for the successful use of enzymes for removing ink from pulp in a non-alkali

K-E

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environment, in particular at a pH of between about 3 to about 8.

4. This is true because the overall thrust of the '299 patent specification, and the evidence provided in all preferred embodiments and in all the Examples, refer to only alkaline deinking conditions. The statement on page 2, last full paragraph, to page 3, end of carryover paragraph, that

> [a]ccordingly, this invention provides a de-inking agent for recycling old paper, containing cellulase. Cellulase commonly occurring in plants, animals, bacteria and fungi can be used in this invention without any special restriction, but alkaline cellulase is especially preferred. Alkaline cellulase is one having optimum pH 8.0 – 11.5 (preferably 8.1 - 11.0). Such enzyme retains its activity in the alkaline range as well as the acid or neutral range, e.g. a product purified and fractionated from cellulase culture liquid of various origins by salting out, precipitation, dialysis and gel fractionation . . .

refers to the conditions under which the enzyme may be purified, and does not suggest the use of the enzyme for deinking under non-alkaline conditions. Even if one were to interpret the statement to indicate the use of the enzyme under non-alkaline conditions, one skilled in the art would not have expected a successful result deinking under non-alkaline conditions, for the reasons described below. The only scientifically supported statements in the '299 patent are directed to the use of deinking enzymes in alkali conditions.

5. A possible reading of the '299 patent is that it is possible for cellulase enzymes to have activity at all pH ranges, but one skilled in the art at the time of this invention would not have tried to deink at a neutral pH, or non-alkaline conditions, because it was thought that alkaline conditions were required to achieve the swelling of the fibers necessary to remove the ink particles.

6. Before the description in the above-identified patent application, it was believed that alkaline conditions were necessary to cause ink containing paper fibers to swell to effect defiberization and deinking by enzymes. Absent alkaline conditions, one would not have expected swelling, and therefore deinking, to occur as a result of the addition of deinking enzymes alone in the pulping process. In the deinking art there is over twenty years of published detailed studies from commercial, academic and government laboratories that emphasize that chemical modification and treatment by alkali exposure is essential and necessary for deinking. As a recent example, enclosed is a copy of the Paper and Pulp

K-EE

International (PPI) publication entitled "Neutral Deinking Makes Its Debut," describing the breakthrough in October 1993 of deinking in neutral conditions, without the addition of alkalis such as sodium hydroxide to the pulp prior to or during deinking.

7. Therefore, to one skilled in the deinking art at the time the above-identified application was originally filed, the deinking action of enzymes in a non-alkaline medium would have been both novel and surprising. An expectation of the successful use of deinking enzymes in an aqueous medium having a pH of between about 3 to about 8 is not found in the '299 patent. It is my opinion that prior to the invention described in the above-identified patent application, no one skilled in the art would have considered evaluating deinking enzymes alone without the addition of alkalis.

8. In summary, it is my expert opinion that the disclosure of the '299 patent supports only the deinking of waste papers by the use of chemical alkaline deinking agents and cellulase, and does not provide a basis for the successful use of cellulase deinking enzyme in an aqueous medium having a pH of between about 3 to about 8 with an expectation of successful deinking of waste paper.

9. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment or both under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issuing thereon.

March 19, 2004
DATE

KARL-ERIK L. ERIKSSON, PH.D.

EXHIBIT
4

DECLARATION OF DOUGLAS E. EVELEIGH, PH.D.

Patents

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Ow et al.	)	
	)	
Serial No.: 09/121,152	)	Art Unit: 1731
	)	
Filed: May 6, 1994	)	Examiner: Steve Alvo
	)	
For: BIOLOGICAL DE-INKING METHOD	)	

DECLARATION OF DOUGLAS E. EVELEIGH, PH.D. UNDER 37 CFR § 1.132

DOUGLAS E. EVELEIGH, PH.D., declares as follows:

1. I earned a Ph. D. in mycology in 1959. Subsequently, I have conducted extensive research in the fields of enzymology, microbiology and biochemistry at Rutgers, the State University of New Jersey. I was recently awarded the Chair in Applied Microbiology, the Eveleigh-Fenton Chair. My studies for 30 years have addressed the roles of bacteria and fungi in wood degradation, including application of the activities of microbes to the good use of mankind. Applications are diverse, ranging from gasohol production from wood through conversion of cellulosics to alcohol by action of cellulase enzymes and alcohol producing bacteria such as *Zymomonas* species, through to novel deflatulence enzymes (Beano type) stable at boiling cooking temperature. Attached is a copy of my Curriculum Vitae.

2. My declaration is based on my scientific experience and understanding of the subject matter as an expert in the art. I am familiar with the invention described in the above-identified patent application regarding the novel use of deinking enzymes under non-alkaline conditions.

3. I have read the English translation of Japanese Patent 59-9299 ('299 patent). In my expert opinion, the '299 patent, read in its entirety, teaches

one of ordinary skill in the art only the successful use of deinking enzymes with alkaline deinking chemicals. It is my opinion that the data provided in the '299 patent, taken together with the knowledge of one skilled in the art prior to the priority date of the present application of May 16, 1989, does not provide an expectation for the successful use of enzymes for removing ink from pulp in a non-alkali environment, in particular at a pH of between about 3 to about 8.

4. This is true because the overall thrust of the '299 patent specification, and the evidence provided in all preferred embodiments and in all the Examples, refer to only alkaline deinking conditions. The statement on page 2, last full paragraph, to page 3, end of carryover paragraph, that

> [a]ccordingly, this invention provides a de-inking agent for recycling old paper, containing cellulase. Cellulase commonly occurring in plants, animals, bacteria and fungi can be used in this invention without any special restriction, but alkaline cellulase is especially preferred. Alkaline cellulase is one having optimum pH 8.0 – 11.5 (preferably 8.1 - 11.0). Such enzyme retains its activity in the alkaline range as well as the acid or neutral range, e.g. a product purified and fractionated from cellulase culture liquid of various origins by salting out, precipitation, dialysis and gel fractionation . . .

refers to the conditions under which the enzyme may be purified, and does not suggest the use of the enzyme for deinking under non-alkaline conditions. Even if one were to interpret the statement to indicate the use of the enzyme under non-alkaline conditions, one skilled in the art would not have expected a successful result deinking under non-alkaline conditions, for the reasons described below. The only scientifically supported statements in the '299 patent are directed to the use of deinking enzymes in alkali conditions.

5. A possible reading of the '299 patent is that it is possible for cellulase enzymes to have activity at all pH ranges, but one skilled in the art at the time of this invention would not have tried to deink at a neutral pH, or non-alkaline conditions, because it was thought that alkaline conditions were required to achieve the swelling of the fibers necessary to remove the ink particles.

6. Before the description in the above-identified patent application, it was believed that alkaline conditions were necessary to cause ink containing paper fibers to swell to effect defiberization and deinking by enzymes. Absent alkaline conditions, one would not have expected swelling, and therefore deinking, to occur as a result of the addition of deinking

enzymes alone in the pulping process. In the deinking art there is over twenty years of published detailed studies from commercial, academic and government laboratories that emphasize that chemical modification and treatment by alkali exposure is essential and necessary for deinking. As a recent example, enclosed is a copy of the Paper and Pulp International (PPI) publication entitled "Neutral Deinking Makes Its Debut," describing the breakthrough in October 1993 of deinking in neutral conditions, without the addition of alkalis such as sodium hydroxide to the pulp prior to or during deinking.

7. Therefore, to one skilled in the deinking art at the time the above-identified application was originally filed, the deinking action of enzymes in a non-alkaline medium would have been both novel and surprising. An expectation of the successful use of deinking enzymes in an aqueous medium having a pH of between about 3 to about 8 is not found in the '299 patent. It is my opinion that prior to the invention described in the above-identified patent application, no one skilled in the art would have considered evaluating deinking enzymes alone without the addition of alkalis.

8. In summary, it is my expert opinion that the disclosure of the '299 patent supports only the deinking of waste papers by the use of chemical alkaline deinking agents and cellulase, and does not provide a basis for the successful use of cellulase deinking enzyme in an aqueous medium having a pH of between about 3 to about 8 with an expectation of successful deinking of waste paper.

9. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment or both under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issuing thereon.

April 12 2004
DATE

DOUGLAS E. EVELEIGH, PH.D.

EXHIBIT 5

Patents

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

TAE JIN EOM ET AL.

Serial No. 08/239,313

Filed: May 6, 1994

For: BIOLOGICAL DE-INKING METHOD

Examiner: Hastings, K.

Art Unit: 1303

DECLARATION OF DOUGLAS E. EVELEIGH UNDER 37 CFR § 1.132

DOUGLAS E. EVELEIGH, PH.D., declares as follows:

1. I am an expert in the areas of enzymology and biochemistry. I am currently a Professor in the Department of Microbiology at Rutgers- the State University, New Brunswick, New Jersey. Attached is a copy of my Curriculum Vitae.

2. My declaration is based on my scientific experience and understanding of the subject matter as an expert in the art.

3. I have read the complete English translation of Japanese Patent 63-59494 ('494 patent). In my expert opinion, the '494 patent, read in its entirety, teaches one of ordinary skill in the art only the use of cellulase, either concurrently or sequentially, with deinking chemicals. It is also my opinion that the '494 patent does not teach or even suggest to those skilled in the art the use of cellulase alone for deinking waste papers.

4. I have read the Office Action dated November 7, 1995 and January 4, 1995. It is my expert opinion that the interpretation of the '494 patent, made by the U.S. Patent Office, is

incorrect in that the teaching of the '494 patent is mischaracterized by finding the '494 patent teaches use of cellulase alone, in the absence of deinking chemicals, to deink waste paper.

The Office Action states that it is not a major conceptual approach to one skilled in the art of cellulolysis to use an enzyme alone. This conclusion, with regard to cellulolysis by cellulase enzymes, is inappropriate. In the cellulase art, there are twenty years of published detailed studies from commercial, academic and government laboratories that emphasize that chemical modification and treatment is essential and necessary for efficient cellulolysis. Therefore, to one skilled in the cellulase art, the de-inking action of cellulase alone is extremely novel and unusual. The teaching of using cellulase alone is not found in the '494 patent.

5. The teachings of the art concerning cellulase activity is that effective treatment of a cellulase substrate requires chemicals to loosen up the cellulose structure to achieve cellulolysis. There is a history of twenty years of teachings that cellulosic substrates must undergo chemical treatment to make them susceptible to cellulase enzyme action. The published scientific literature is replete with international studies in this regard. The teachings of the numerous published studies indicating that cellulase alone is ineffective in attacking cellulose is in stark contrast to the Examiner's finding that use of cellulase alone is taught or suggested in the '494 patent. It is my opinion that no one skilled in the art of cellulases would waste time, money or effort in evaluating cellulase alone and without its combination with other de-inking agents.

6. An additional teaching in the art is that hydrolase enzymes, such as cellulase, that attack insoluble substrates, such as cellulose, are unique. Enzymes attacking insoluble substrates fall into a distinct class and are different from other types of enzymes in many ways. One skilled in the art of cellulolysis would not use cellulases in the same manner as other types of enzymes. One skilled in the art of cellulolysis would not expect cellulases to respond in the same manner as

other types of enzymes. Therefore, generalizations from other types of enzymes cannot be applied to cellulase enzymes.

7. In summary, it is my expert opinion that the U.S. Patent Office has misinterpreted the '494 patent, and that at the time of the invention, the disclosure of the '494 patent taught the deinking of waste papers by the use of chemical deinking agents and cellulase, and did not teach or suggest the use of cellulase alone to deink waste papers. It is clear to me that any person skilled in the use of cellulase would not use cellulase alone. The '494 patent does not address the uniqueness of cellulases and does not provide a teaching that would enable one to use the unique cellulase enzyme alone.

8. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment or both under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issuing thereon.

Date: Jul 8 96

Douglas E. Eveleigh, Ph.D.

Suppliers of deinking s ems are working to meet the demand for high-quality paper made from low-quality waste. Amanda Marcus rounds up the latest developments and lists new orders worldwide.

EXHIBIT 6

ATTACHMENT 1

Neutral deinking makes its debut

SOME RECENT AND PLANNED DEINKING INSTALLATIONS[1]

Country	Company	Mill location	Startup date	Capacity (1,000 tons/yr)	Wastepaper	Grade	End-use Supplier
Australia	Australian Newsprint Mills	Lavington, NSW	1993	122.5*	News/magazines	Newsprint	Voith
Austria	Laykam-Müztaler	Gratkorn	1993	40*	News/magazines	Newsprint	Voith[2]
Argentina	Celulosa Campana	Zarate	1994	45.5	Mixed waste	Tissue	Sulzer Papertec
Argentina	Papel Prensa	Buenos Aires	1993	21	Waste	Newsprint	Lamort
Canada	Alberta Newsprint	Whitecourt	1993	21*	News/magazines	Newsprint	Voith[3]
Canada	CIUNO (Quebec & Ontario Pap)	Thorold	1993	70*	News/magazines	Newsprint	Voith[3]
Canada	Spruce Falls Power & Paper	Kapuskasing	1993	87.5*	Old news/pamphlets	Newsprint	Voith[3]
China	Guangzhou Paper	Guangzhou	1993	32	Ledgers	Fine paper	Black Clawson
China	Hanzhong Pulp & Paper	-	1994	9	Waste	Whiteboard base	Lamort/Aikawa
China	Xuecheng Huazhong Paper	-	1993	9	Waste	Whiteboard base	Lamort/Aikawa
China	Yunjin Paper	Nanping	1994	35*	News/magazines	Newsprint	Bolelt
France	Chapelle Darblay	Pont Audemer	1993	6	Ledgers	Fine paper	Black Clawson
Germany	Dresden Papier	Freital	1994	42	News/magazines	Graphic papers	Sulzer Papertec
Germany	Palm	Eltmann	1994	168	News/magazines	Newsprint	Sulzer Papertec
Germany	Sachsen Papier	Eilenburg	1994	350	News/magazines	Newsprint	Sulzer Papertec
Germany	Schwedt Pap. und Karton	Schwedt	1994	143.5	News/magazines	Graphic papers	Sulzer Papertec

*1: This list is not intended to be comprehensive. Orders since the last PPI Deinking Survey in October 1992. 2: Built by Voith St. Pölten, Austria, a Voith licensee. 3: Built by Voith Appleton, USA, a Voith licensee. 4: Andritz was acting as a licensee of Sulzer Papertec, Germany. * = Calculated from daily capacity, on the basis of 350 production days/yr.*

Continued on page 24

WASTE IS NO LONGER a dirty word. On the contrary, an increasing number of consumers, and hence papermakers, can't seem to get enough of it. According to PPI statistics (see table), the world recovered almost 92 million tons of wastepaper in 1992, up from 87 million tons in 1991, and consumed 95.5 million tons, four million tons more than the previous year. The world's average utilization rate has risen by two points to 39%.

From Argentina to Austria, and Mexico to Morocco, the latest reference lists from suppliers *(see above)* show that mills are still spending money on waste treatment systems, even during a time of severe cutbacks in capital investment in the industry. Increasing environmental legislation and stringent quality requirements are demanding rapid developments from manufacturers of deinking equipment. This article rounds up the latest news from some of the sector's major suppliers.

All agree that differences in customer demands in Europe and North America are narrowing. Black Clawson, USA, reports that US customers are beginning to look at the European approach to projects, looking for more liability from the supplier to make the system perform. "As more of these projects come under study, it is becoming apparent that the vendor's ability to provide special financing or equity participation is becoming as important as the technological issues that have always faced us," comments Black Clawson.

The parameters of evaluation from the customers' viewpoint are basically the same: All mills are seeking price performance, higher brightness, dirt reduction, ash control and higher yields from their systems: no mean task for suppliers.

Customers want more for less

One of the major challenges facing suppliers of wastepaper treatment systems is that mills are using lower-quality and hard-to-deink waste while requiring ever-higher quality. As a result, according to Black Clawson, research in the USA is focusing largely on the removal of difficult-to-handle debris that is typically found in grade office papers: unbleached fibers, laser-printing inks, UV coatings and some dyed papers. The supplier adds that it is only a matter of time before the same concerns are transferred to system designers in the European and Asian markets.

Mills get into neutral gear

Neutral deinking is being hailed as the latest breakthrough in waste treatment technology by Lamort of France. It says that the benefits of deinking in neutral media are proving to be far beyond initial expectations. Such a solution is attractive because it requires less chemicals, so chemical oxygen demand is reduced and companies save on chemical costs. Suppliers to the industry say that controllability, drainage, pulp strength, bleachability and screening efficiency are all better than with conventional deinking techniques.

The Stephenson Group, UK, which supplies deinking chemicals, agrees that demand for neutral deinking solutions and closed-water circuits is growing. Customers want to use lower and lower grades of

DEINKING SURVEY TRADE

wastepaper for deinking, comments the company, and this is leading to problems with product quality (both brightness and stickies), which the customer expects the supplier to solve.

In response, a considerable amount of resources is being invested in upgrading washing systems as part of a "complete ink removal" solution provided by a combined wash/flotation system. Cost is the limiting factor, explains Stephenson, but work on the concept is continuing.

The first neutral deinking system using household waste to make graphic papers is already in operation at Zwingen in Switzerland. The line started up last July and is the result of a joint project between the mill, French supplier Lamort, and Dr. W. Kolb. Lamort explains that since the process does not use sodium hydroxide, an efficient fiber-to-fiber friction is imperative if good ink removal is to be achieved at the pulping stage, although post-flotation is still available. Lamort recommends its Helico pulper for such applications.

Waste is floating on air

Neutral flotation is quite different to conventional deinking in that the ink particles adhere directly to the air bubbles, Lamort explains. The foam structure of the cell is also completely different. Consequently, demand is growing for a flotation cell which can handle an increased number of smaller bubbles and separate foam from fiber. Lamort's response is the Verticel which works on the concept of injection and has a controlled flow pattern.

Lamort says that Verticel has a foam-removal system which is particularly suited to neutral deinking.

Voith, Germany, is also continuing work on flotation and has recently launched its new laboratory flotation cell type E, a reduced version of the industrial unit. Five have already been sold.

Voith's flotation machine consists of a mixing tank followed by primary and secondary stages with the secondary stage being used to recover useful fibers from the overflow of the primary stage. Each stage is composed of tubular cells arranged in series, the number and size of which depend on the flotation behavior of the printing inks and on the throughput.

According to the supplier, the unit's main advantages lie in maximum brightness with low energy consumption and an above-average purity of deinked stock, due to multiple, consistent, forced ventilation of each cell. Flotation is accelerated because air supply is increased, requiring fewer cells, explains the supplier.

Black Clawson is working with its licensee in Japan, IIM, on the new IIM-BC Flotator flotation cell. According to the supplier, the key to the unit's performance is its ability to mix uniformly high volumes of air into the stock slurry so that maximum brightness and dirt speck removal can be achieved. The air bubbles that are generated by the twin turbines in each cell are evenly distributed across the spectrum of sizes needed to optimize particle-removal efficiency, from 5-500 microns.

Black Clawson claims that the Flotator can improve brightness by 14 points in a single pass, and that it has shown improved speck removal efficiency, even with hard-to-deink grades such as laser-printed office papers or UV-coated grades. The supplier intends to market the Flotator unit on both sides of the Atlantic.

EXHIBIT 7

Patents

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
Ow et al.	)	
Serial No.: 09/121,152	)	Art Unit: 1731
Filed: May 6, 1994	)	Examiner: Steve Alvo
For: BIOLOGICAL DE-INKING METHOD	)	

DECLARATION OF HARALD SCHMID UNDER 37 CFR § 1.132

HARALD SCHMID, declares as follows:

1. I earned an Engineer Diploma in 1992 from Munich University. My principal course of study was in Pulp and Paper Science. Subsequently, I have worked in the pulp and paper industry my entire career in Germany, Switzerland, and the United Kingdom. I am an expert in deinking chemistries in which I worked almost exclusively during, and shortly after, my time at Munich University.

2. My declaration is based on my scientific experience and understanding of the subject matter as an expert in the art. I am familiar with the invention described in the above-identified patent application regarding the novel use of deinking enzymes under non-alkali conditions.

3. I have reviewed the article contained in the Paper and Pulp International (PPI) publication entitled "Neutral Deinking Makes Its Debut," describing the breakthrough in October 1993 of deinking in neutral conditions, without the addition of alkalis such as sodium hydroxide to the pulp prior to or during deinking.

4. That publication refers to the use of deinking at neutral conditions at the Zwingen mill in Switzerland.

5. That mill is owned by Zwingen AG and is based in Zwingen, Switzerland. I was project manager at the Zwingen mill. I was directly involved with the design, construction, and early operation of their new deinking plant which began operation in

DECLARATION OF HARALD SCHMID

May 1993.

6. The Zwingen mill deinks a variety of wastepaper grades using the floatation process. The Zwingen mill produces an assortment of paper grades including book paper, business form paper and photocopy based paper.

7. In 1992, I worked with the Zwingen mill owners to design the mill around a neutral deinking concept. It is my understanding and belief as one of skill and knowledge in the art at that time that the Zwingen mill was the first of its type in the world intended to be built and run on a neutral flotation deinking concep. There was no suggestion of non-alkali deinking at the Zwingen plant of which I was aware prior to 1992. The concept was tested and proven as effective in a pilot plant trial in 1992. The pilot plant trial created the proof to proceed with the design and the construction of the deinking plant in 1992, which concluded with the start up of the deinking plant in May of 1993.

8. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issuing thereon.

7.5.2004
DATE

HARALD SCHMID

Related Proceedings Appendix

None